MATERIAL FOR OCULAR PROSTHETICS

FIELD OF THE INVENTION

The present invention relates to ophthalmology and is particularly concerned with materials for ocular prosthetics. The invention can find widespread application in diverse sight correction techniques for making a variety of optical correcting elements, in particular, prosthetic crystalline lenses or lenticuli, and also for partial substitution of injuried ocular structures.

BACKGROUND OF THE INVENTION

Materials for ocular prosthetics now in current use must satisfy a number of rather strict requirements, the principal ones being as follows: the materials in question should feature high mechanical properties, be optically transparent and biologically intert towards the ocular structures and the intraocular humor. It is quite expedient that the materials applied for ocular prosthetics have as low density as possible and be elastic.

Known in the art is use for ocular prosthetics of such materials as glass, polymers, in particular, polymethylmethacrylate, and liquid silicone.

However, properties of the materials used place not infrequently substantial limitation upon their application in the field of eye surgery. To take an example, liquid silicones are successfully applicable solely for partial substitution of the vitreous body in case of vitrectomy. Polymethylmethacrylate that has found extensive application as a material for making lenticuli is in fact too stiff of a material, which compels surgeons to considerably enlarge the operative wound. Glass has not so far found fairly broad application due to its high specific density.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a material for eye surgery, which would feature low density, good mechanical characteristics and high optical properties, elasticity and be biologically inert with respect to the ocular tissues and the intraoscular humor.

It is another object of the present invention to provide such a material that, apart from featuring all the aforestated properties, would possess good processability, i.e., would enable formation of, e.g., lenticuli in a single production process.

The aforesaid and other objects are accomplished due to the fact that the material for eye surgery, according to the invention, is a silicone-based compound made from a cured composition resulting from vulcanization of a mixture of α,ω-bis-trivinylsiloxyoligodimethyl (methylphenyl-siloxane and α,ω-bis-trimethyl(dimethylhydro)siloxyoligomethyl(phenyl)methylhydro-siloxane in the presence of a polyaddition reaction catalyst based on the compounds of metals of the platinum group, the ratio of the first mixture component to the second one rabging within 100:1 and 100:20 parts by mass.

It has been found that the ratio of the first component to the second one may not exceed 100:1 as otherwise the mechanical strength of, e.g. a lenticulus made from the material under consideration is so reduced that it cannot be implanted in the eye without its deformation, nor may said ratio be less than 100:20, since at lower ratios the number of postoperative complications increases due to too high stiffness acquired by the lenticulus and enhanced adhesive properties of the material at elevated temperatures.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In what follows the invention will be illustrated in a description of some specific but not limiting embodiments of producing the material according to the invention.

Example 1

There are intermixed for a few minutes manually or with the use of a mechanical stirrer, 15 g α,ω-bis-trivinylsiloxyoligodimethyl-siloxane (hereinafter referred to as Component I), and 0.15 g α,ω-bis-trimethyloxyoligodimethylmethylhydro-siloxane (Component II) until complete homogenization of the composition. Then added to the resultant mixture is 0.08 g one percent solution of, e.g., $H_2PtCl_6.6H_2O$ in insopropanol as a catalyst. The mixture is stirred, exposed to vacuum to eliminate the occluded air, and dispensed in the appropriate moulds made of fluorinated plastic or of a specially treated metal, to obtain a required item. Then thus-filled mould is placed in a temperature-controlled cabinet at 130° to 180° C. and allowed to stand there for 0.5 to 2 hours. Once the mould has been cooled, the finished product is extracted therefrom.

The material of the invention involving other ratios of the Components I and II is prepared in a similar way. Some other ratios of the components are tabulated in Table 1 below, wherein the physico-mecanical characteristics of the material are specified.

Example 2

Whenever necessity arises in use of a material featuring higher refractive index, a mixture of 15 g α,ω-bis-trivinylsiloxyoligodimethylmethylphenyl-siloxane, 0.45 g α,ω-bis-trimethylsiloxyoligodimethylmethylphenylmethylhydro-siloxane, and 0.15 g one-percent solution of $H_2PtCl_6.6H_2O$ in tetrahydrofuran in a way similar to Example 1. Further treatment is conducted as described in Example 1. For the physico-mechanical characteristics of the product refer to Table a below.

Example 3

Whenever it becomes necessary to use a material having increased elasticity, a mixture of 15 g α,ω-bis-trivinylsiloxyoligodimethylmethylphenyl-siloxane, 1.5 g α,ω-bis-dimethylhydrosiloxyoligodimethylmethylphenylmethylhydro-siloxane, and 0.1 g of a catalist, which is in fact a one-percent solution of a complex compound, resulting from interreaction of $H_2PtCl_6.6H_2O$ with 1,1,3,3-tetramethyl-1.3-divinyldisiloxane, in isopropanol.

Principal mechanical and optical characteristics of the materials obtained according to the aforedescribed Examples are tabulated below.

TABLE 1

Ratio of Components I and II	Density, g/cm³	Refractive index	Light transmission factor, %	Ultimate tensile strength, MPa	Percentage elongation
Example 1					
100:1	0.99	1.410	98.5	4.0	120
100:10	0.97	1.408	99.0	3.5	100
100:20	0.95	1.405	99.0	3.0	100
Example 2					